

## **Iowa Leading Indicators Index: Fifth Annual Assessment and Update**

Tax Research and Program Analysis Section

Iowa Department of Revenue

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In 2006, the Iowa Department of Revenue (IDR) created the Iowa Leading Indicators Index (ILII) as a tool to predict turning points in Iowa employment. By foreshadowing changes in the level of employment, which is closely linked to the level of individual income tax and sales tax receipts, the ILII also provides a signal of changes in these major revenue sources for the State. IDR has issued monthly ILII reports since the start of fiscal year 2007 and posted the reports on the IDR Web site (<http://www.state.ia.us/tax/taxlaw/econindicators.html>). The ILII, signaling the start of the recovery in December 2009, successfully forecasted the expansion in Iowa employment that started in October 2010. Likewise, the positive signals from the ILII were followed by a 5.2 percent increase in State revenues during FY 2011.

Annually the Department assesses how well the ILII has met the goals underlying its development, gauges the validity of the existing components, considers any additional components that may have been suggested in the past year, and carries out the necessary annual updates. This paper documents the fifth annual assessment and update to the index. A step-by-step presentation of how the ILII is computed can be found in appendix A. The calculation of the diffusion index is discussed in appendix B.

### ***Assessment of the Iowa Leading Indicators Index for Fiscal Year 2011***

The ILII experienced positive changes during the first ten months of fiscal year 2011, rising from 99.8 in July 2010 to 104.9 in April 2011, recovering from an unprecedented drop to 94.4 in September 2009 (see Figure 1). In the last two months of the fiscal year, the index logged slight declines each month, falling to 104.8 in June 2011. However, the non-farm employment coincident index, the 12-month moving average of non-seasonally adjusted, non-farm employment, experienced increasing

growth each month from October 2010 through June 2011.<sup>1</sup> Since 1999, the index has signaled a recession twice, from December 2000 through September 2001 and from August 2008 through November 2009, followed by declines in employment stretching from July 2001 through December 2003 and November 2008 through October 2010, respectively.

During 2010, state gross domestic product (GDP) rose along with Iowa personal income and State revenues. After dropping in 2008 (-1.7%) and 2009 (-0.1%), GDP grew an estimated 3.9 percent in 2010 (see Figure 2). Real personal income in Iowa grew 3.5 percent in 2010 after declining 1.0 percent during 2009 (see Figure 2). It is difficult to gauge the ability of the monthly ILII to signal changes in either state GDP or state personal income because these series are released infrequently, annually and quarterly respectively, and are subject to major revisions. Therefore the ILII is compared, on a monthly basis, to non-farm employment in Iowa, as reported by the Bureau of Labor Statistics. However, another test of the usefulness of the ILII is to compare movements in the index to the level of State General Fund revenues (see Figure 3). Iowa real revenues are measured using 12-month moving average of individual, sales and use, corporate, inheritance, insurance premium, cigarette and tobacco, and franchise receipts, all adjusted using the Consumer Price Index (CPI) to 2010 dollars. While total receipts showed steady growth from in fiscal years 2007 through 2009, partly a result of law changes during that time, receipts dropped in most months of fiscal year 2010. However, receipts grew throughout fiscal year 2011 with all major sources of General Fund revenue, including individual income, sales and use, and corporate income, experiencing gains.

Although the Department forecasts all sources of revenue for the State, the ILII is best suited to signal the future direction of taxes on employment and wages, or individual income tax revenues. Net individual income tax revenues are a 12-month moving average of withholding plus estimate payments plus final return payments minus refunds, all adjusted to 2010 dollars using the CPI (see

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<sup>1</sup> The non-farm employment index first showed growth in July 2010, although the first three months of growth were revised to slight declines with the annual benchmarking by the Bureau of Labor Statistics completed in March 2011.

Figure 4). Note that individual income taxes comprise over 50 percent of State General Fund revenues. The initial drop in individual income tax revenues in 1999 reflects the individual income tax cut implemented during the 1998 tax year. Individual income tax revenues were strong in the spring of 2000, but fell in 2001 and 2002 with the national recession. Revenues began to rise again in 2004 and remained relatively strong through 2008, with a slight dip in 2005 and 2006. Net individual income tax revenues turned down in February 2009, following the ILII drop that started in April 2008. During fiscal year 2010, individual income tax receipts started to recover in the spring as withholding and estimate payments picked up. As the ILII continued its upward climb through the first ten months of fiscal year 2011, individual income tax revenues rose consistently from June 2011 through February 2011 only to dip in March and April as refunds were paid more quickly than in the prior fiscal year. This also explains the strong rebound in May. For the year as a whole, on a cash basis, receipts rose 7.0 percent while refunds rose 2.4 percent, resulting in an increase in net individual income tax revenues of 5.9 percent.

The main goal for the Iowa Leading Indicators Index is to serve as an additional tool in predicting the direction of the State economy. Indeed, the ILII began to decline in April 2008 and showed a contraction signal in August 2008. Three months later, the Iowa non-farm employment index began to show declines, following the path of the slowing national economy. The index reached a bottom in September 2009, then moved out of recession signal territory in November 2009, suggesting that the Iowa economy would see employment gains by mid to late summer. Those gains did not materialize until fall 2010, but employment has continued to creep up since October 2010, following the positive changes in the index. It is still too early to predict what the recent small declines in the index are signaling about the future of employment. However, results over the past three years demonstrate that the ILII is a helpful tool in predicting turning points in Iowa non-farm employment.

### ***Validity of Existing Components***

When the Iowa Leading Indicators Index was established in 2006, one method used to select components was to identify series of Iowa data that were equivalent to those used as leading economic indicators by other states and regions. This method resulted in the selection of Iowa unemployment insurance claims, average manufacturing hours in Iowa, and the new orders index for Iowa manufacturers. A second method used to select components was to identify series that predicted economic activity in the key sectors of the Iowa economy: agriculture, manufacturing, and finance. Agriculture comprised 5.9 percent of Iowa gross domestic product (GDP) in 2010. To capture the agriculture sector, an index of expected profits for producers of the four leading commodities in the state, corn, hogs, soybeans, and cattle was created. Manufacturing accounted for 17.8 percent of GDP and 13.6 percent of non-farm employment in 2010. Along with average manufacturing hours and the new orders index, diesel fuel consumption was added to the index to measure demand for the transport of manufacturing inputs and final products within and through the state. Diesel fuel consumption also indicates demand for the production and transport of agricultural commodities. The finance sector accounted for 13.6 percent of GDP and 6.9 percent of non-farm employment in 2010. The finance sector is heavily represented in the Iowa stock market index, created as another component for the index.

During the development of the ILII, all potential indicators were weighed against six desired attributes of leading indicators that are known as the Moore-Shiskin criteria:

1. conformity – series must conform well to the business cycle
2. consistent timing – series must exhibit a consistent timing pattern over time as a leading indicator
3. currency – series must be published on a reasonably prompt schedule and not be subject to major revisions
4. economic significance – cyclical timing of the series must be economically logical

5. statistical adequacy – data must be collected and processed in a statistically reliable way
6. smoothness – month-to-month movements in the series must not be too erratic.

Continuing the success of the prior four years, during fiscal year 2011 the ILII continued to exhibit all of these attributes. As noted in the introduction, the index successfully predicted the path of employment during 2011, and thus demonstrated conformity and consistency. During FY 2011, six of eight components experienced gains (see Table 1). The largest positive contribution was made by the agricultural futures profits index which added 2.59 points to the index between June 2010 and June 2011 as prices for all four commodities soared while input costs increased only slightly. Another large positive contribution was made by unemployment insurance claims as the number of claims fell throughout the year. The national yield spread and new residential building permits were the two negative contributors, reflecting the continued efforts of the Federal Reserve to hold down interest rates and the ongoing weakness in the housing sector. Although the components moved in different directions, the individual signals representing different sectors of the economy appeared to conform to the current stage of the business cycle – recovery. Likewise, the components and index exhibited a consistent timing pattern as a leading indicator of future economic activity, where the positive changes in the indicators signaled future growth in Iowa employment which started in October 2010 and continued through June 2011.

Currency of the ILII's components proved to be very reliable during FY 2011. All components were available within four weeks after the close of the month for all months except January. In that month, labor force data including average manufacturing hours and non-farm employment were delayed by several weeks because the Bureau of Labor Statistics (BLS) was undertaking its annual benchmarking. During FY 2011 the level of the index was revised in three months, December 2010,

February 2011, and April 2011, decreasing 0.1 percent in all cases. The revisions were triggered by downward changes to the preliminary manufacturing hours as they were finalized by BLS.

Nothing in the past twelve months has changed opinions about the economic significance of the eight components as all continue to logically lead the economic cycle. Similarly, views about the statistical adequacy of the data are also unchanged as sources for all the data series continue to be reliable.

Assessments of the components' smoothness did not change with the additional 12 months of data. The standard deviation of month-to-month changes in the components (measured for all but the yield spread and stock market index using 12-month moving averages) increased for half of the eight components (see Table 2). The largest increase, 17.1 percent, was observed for the agricultural futures profits index, resulting from the volatile commodity prices during the last year. The ILII is computed by weighting changes in the individual series by the standardization factors, calculated as the inverse of the standard deviation, normalized across all the components to one (see Appendix A). Preliminary updates to the standardization factors accounting for the observed volatility during FY 2011 suggest the factor for the Agricultural Futures Profits Index (AFPI) will drop 13.9 percent followed by a 4.3 percent drop for unemployment insurance claims. All other factors will increase slightly.

An additional way to consider sensitivity is to focus on six-month percentage changes in the index and six-month diffusion index values under various modified versions of the index where, in each case, one of the eight components is excluded (see Table 3). Following the Conference Board, who publishes the national Leading Economic Indicators after which the ILII was modeled, a contraction signal is the point when the annualized six-month percentage change declines by over two percent

and the six-month diffusion index falls below 50.0.<sup>2</sup> The six month changes to the ILII remained in positive territory throughout FY 2011 independent of the signal from any given component. However, the positive change weakened as the year came to a close regardless of whether any one component was removed from the ILII calculation.

### ***Comparison of the ILII to the Philadelphia Leading Index for Iowa***

In June 2010, the Philadelphia Federal Reserve began to publish leading indexes for all 50 states. The Philadelphia index relies on a regression analysis method that uses the historical relationship between four leading economic measures (state-level housing permits, state initial unemployment insurance claims, delivery times from the Institute for Supply Management (ISM) manufacturing survey, and the national yield spread) and current economic activity to predict future economic activity. The index provides a predicted six-month growth rate of the state's coincident index (a measure of state employment counts, the unemployment rate, manufacturing hours, and wages and salaries). The ILII follows a more traditional method, also used by the Conference Board to produce the national Leading Economic Index, of aggregating the monthly changes of various economic measures believed to lead general economic activity as a measure of the direction of expected future economic activity. Changes in the index provide a signal of future economic activity, with a focus on both the direction of the change and the breadth of the change across the various indicators (measured using a diffusion index).

The indexes have been providing consistent signals over the last few years, with steep downturns in the first months of 2008 (February for the Philadelphia index and March for the ILII) leading the drop in Iowa employment that began in October 2008 (see Figure 5). Signals of recovery appeared in the ILII in October 2009 and January 2010 for the Philadelphia index, leading the growth in Iowa

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<sup>2</sup> The -2.0 percent annualized decline was the threshold for a recession signal prior to the 2001 revisions to the National Leading Indicators Index. At that time, The Conference Board moved to forecasting several of the components in the index, those not available until more than three weeks after the close of a month. With those revisions, the threshold for a recession signal was lowered to -3.5 percent. However, because the ILII relies on actual data series, the -2.0 percent threshold is still used.

employment that began in the fall of 2010. Both signaled weakness during the last few months of FY 2011, although predicted growth rates under the Philadelphia index remained positive as did the six-month annualized percentage change in the ILII.

Because the Philadelphia Fed is providing a consistent set of leading indexes for all 50 states, the components used are less targeted to Iowa than the ILII. The ILII contains eight indicators including three of the same as the Philadelphia index: Iowa initial unemployment insurance claims, new Iowa housing permits (although the ILII uses a slightly broader measure, total permits issued versus permits issued for buildings with 1 to 4 housing units), and the national yield spread. The ILII also contains average manufacturing hours, new orders for Iowa manufacturing companies from Creighton University's Business Conditions Index, Iowa diesel fuel consumption (capturing the demand for delivery of intermediate goods by Iowa manufacturers into and around the state and final products shipped outside and around the state). In addition, two indexes that track industries and companies specific to Iowa were developed as indicators for the ILII, the agricultural futures profits index (changes in expected profits for corn, soybeans, hogs, and cattle), and an Iowa stock market index (capitalized value of Iowa-based publicly-traded companies, and publicly-traded companies with a large Iowa presence). The latter are very important to capturing the direction of the Iowa economy where agriculture and the financial sector play a much larger role than in most states.

#### ***Updates for the Fourth Year***

Given that the original eight components continue to meet the Moore-Shiskin criteria and no new series were added, the steps required to prepare the ILII for FY 2012 were an update to the Iowa stock market index to account for business changes that occurred during the last year and an update to the Agricultural Futures Profits Index incorporating updated historical break-even costs for corn and soybeans as well as the most recent data on annual cash receipts. In addition, the annual update to

the standardization factors for the ILII was completed, causing a revision to the entire history of the ILII.

#### *Updates to the Iowa Stock Market Index*

During fiscal year 2011, one company in the Iowa stock market index was purchased by an existing publicly-traded company. At the time, the valuation for the original company was adjusted based on changes in the valuation of the purchasing company. However, as part of the annual update, the original company's series was replaced with the historical series of the purchasing company. A second company was changed to a privately-held firm during the year. At the time, the valuation for the company was held fixed at the last sale price. As part of the annual update, the company was removed from the index.

Qwest Communications (Q), a telecommunications company headquartered in Denver, CO, merged with CenturyLink, Inc. (CTL), a telecommunications company headquartered in Monroe, LA, with the merger finalized on April 1, 2011. The resulting company trades under the CTL ticker symbol on the New York Stock Exchange. Because it is believed the new company will maintain a major presence in Iowa as one of the major telecommunications companies, it was decided that CenturyLink should replace Qwest Communications in the Iowa stock market index. Public data on historical CenturyLink prices only extend back to August 2001, while prices for Qwest are available through the inception of the Iowa stock market index. Shares outstanding for CenturyLink back to 1999 were available (the company was CenturyTel then). Therefore, the historic valuation of CenturyLink combines prices of Qwest, adjusted for observed differences in the month of overlap in August 2001, multiplied by the shares outstanding for CenturyLink.<sup>3</sup> At the time of the merger, CenturyLink issued nearly 300 million additional shares, significantly increasing the value of the company.

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<sup>3</sup> This assumes that the stock price of CenturyLink, then known as Century Tel, would have experienced the same daily movements as Qwest, both telecommunications companies with a presence in Midwest markets. The historical valuation of CenturyLink was fixed between 1984 and 1998 because Century Tel underwent several stock splits during that period which makes the Qwest price data during that same time an inadequate proxy.

Mediacom Communications, (MCCC) a telecommunications company headquartered in Middleton, NY, became a private company on March 4, 2011. Therefore the company was removed from the index.

Replacing Q with CTL and dropping MCCC from the Iowa Stock Market Index decreased the value of the index between five to ten points in recent years reflecting the higher valuation of CTL in the base period. The stock market index is standardized to an average value of 100 for the 1984-1986 period; if the total valuation for that period rises, the entire index falls. However, the impact on the ILII, which captures changes in the components, and not levels, was an average increase of 0.2 points per month since during the recovery, with smaller increases of 0.1 point per month in the 2002 through 2008 period.

#### *Updates to the Agricultural Futures Profits Index*

The AFPI requires annual updates to the index to account for newly available data on the distribution of annual cash receipts among the four commodities in the index and to incorporate the last 12 months of data in the standardization factors used to weight the index. Additionally, updated historical break-even costs for corn and soybeans were incorporated.

In March 2011, the historical break even cost series for corn and soybean production, calculated by Donald Hofstrand and Ann Johanns, Extension Specialists at Iowa State University, were revised. The series originally represented the typical production costs in northern Iowa, essentially north of Interstate 80. The change made the series reflect the production costs averaged over the entire state. In some years, historical breakeven costs were increased, corn costs were raised 11 cents on average in 2008, while in other years historical breakeven costs were decreased, soybean costs were lowered 30 cents on average in 2008. In March, only changes back to the start of the 2010 crop year,

impacting June 2010 and later expected profits, were incorporated. However, the annual update provided an opportunity to incorporate the full series of changes which impacted nearly the entire series (through April 2011) of the 12-month moving average of expected profits. The ILII dropped as much as 0.1 per month in 2001 and 2002 and rose as much as 0.1 per month in 2005 and later as a result.

Each fall annual cash receipts for various farm commodities in Iowa for the previous calendar year are released by the Economic Research Service of the U.S. Department of Agriculture. The distribution of cash receipts between the four commodities included in the AFPI is used to weight the four profits series in the index. With the release of the 2010 cash receipts, all AFPI values for January 2010 and later were updated to reflect the distribution of farm cash receipts for calendar 2010. In 2010, total farm cash receipts for Iowa rose 5.5 percent with total corn receipts rising 1.2 percent, hog receipts jumping 19.9 percent, and cattle receipts increased 18.2 percent compared to 2009. Conversely, soybean receipts fell 6.3 percent with lower prices for the new crop compared to 2009. In response to these changes, the distribution of receipts between the four commodities changed. The corn share of cash receipts between the four commodities dropped from 40.7 percent to 38.1 and the soybeans share dropped from 23.2 to 22.8. The hog share rose from 23.2 to 25.2 percent and the cattle share rose from 12.9 to 13.9 percent. In addition, the USDA made minor revisions to 2008 and 2009 income numbers.<sup>4</sup>

#### *Assessment of Update Impacts on the ILII*

After updates to the Iowa stock market index and AFPI for 2012 were completed, the standardization factors were finalized (see Table 4). The updates to the AFPI dampened its historical volatility, resulting in an 8.1 percent drop in its standardization factor compared to the preliminary 13.9 percent

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<sup>4</sup> The AFPI also uses standardization factors to equalize the volatility among the four commodities. The standardization factors, computed as the inverse of the standard deviation of the monthly changes in each of the four profit series, increased for corn and decreased for soybeans, hogs, and cattle. Because only one set of factors is used to calculate the full history of the series, this update caused small changes in all AFPI values.

drop. The change in the composition of the stock market index decreased its volatility as well, resulting in a 6.6 percent increase in its standardization factor.

As a result of the updates, the historical values of the ILII changed with the July 2011 report. The changes are small in most months, with 0.3 point increases during the 2004 through 2007 period, as well as a 0.4 point increase in the index at the bottom of the recent fall (see Figure 6). For the January 2011 through June 2011 period, the changes are minor (see Tables 5 and 6). The level of the index is higher in January through April, the same in May, and down 0.1 point in June. The monthly changes remained positive in January through April, but dropped to 0.2 percent in May compared to 0.1 percent previously. The monthly change for June remained -0.1 percent. The six-month annualized percentage changes dropped slightly, but remained positive. The six-month diffusion index in June is now above 50, resulting from the update to the stock market index that reduced the magnitude of its recent decline.

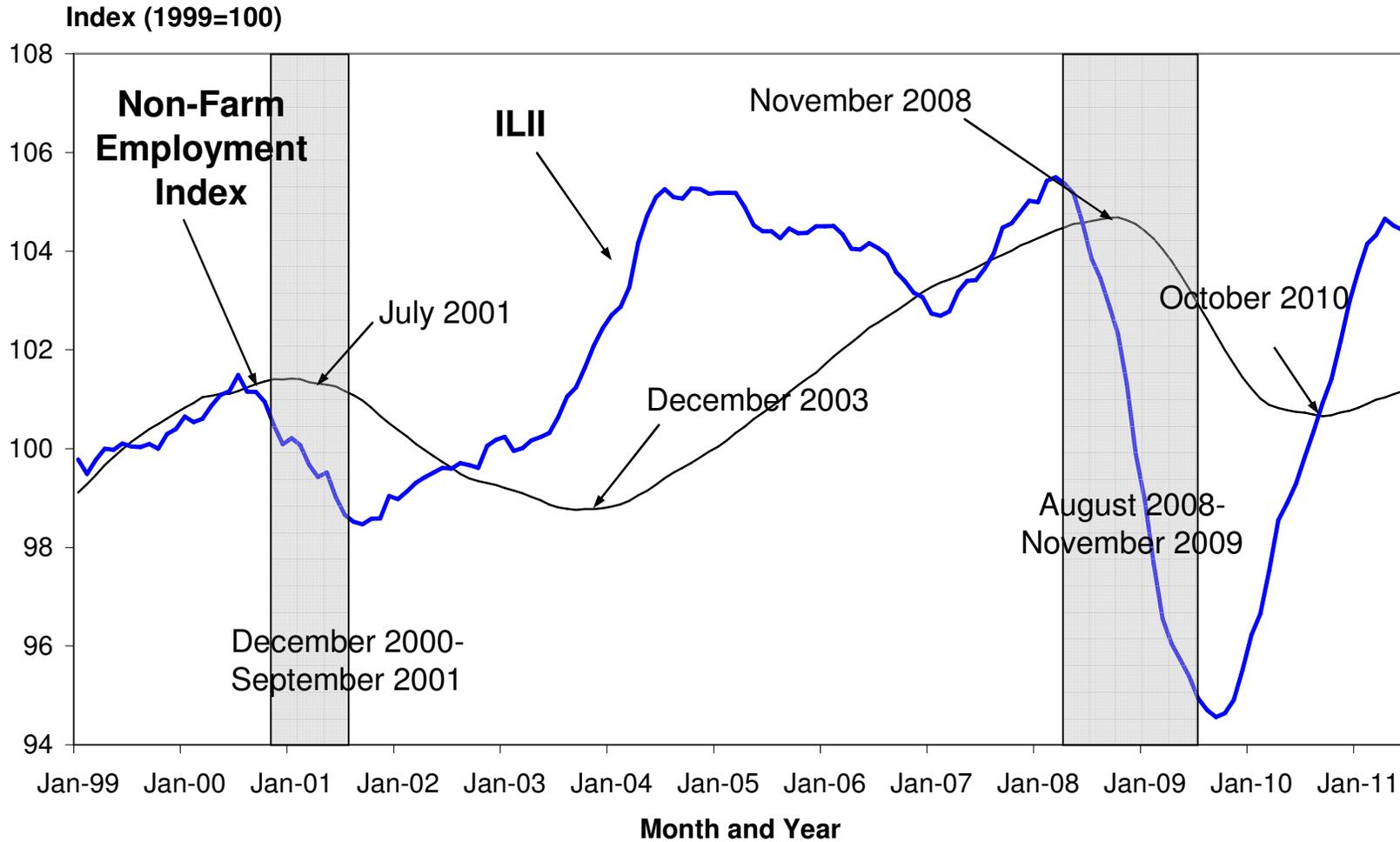
For the values of the components themselves, both the Iowa stock market index and AFPI fell with the update to the calculation of the components (see Tables 7 and 8). The stock market index values are lower, a result of dropping one company and recalibrating the index to account for the replacement of a second. The updates made to the AFPI changed the historical profit values for corn and soybeans as well as changing the value of the AFPI series. Those values, which were added to the tables in italics, are lower after the update reflecting the lower weight for 2010 and later on the more profitable soybeans.

### ***Conclusions***

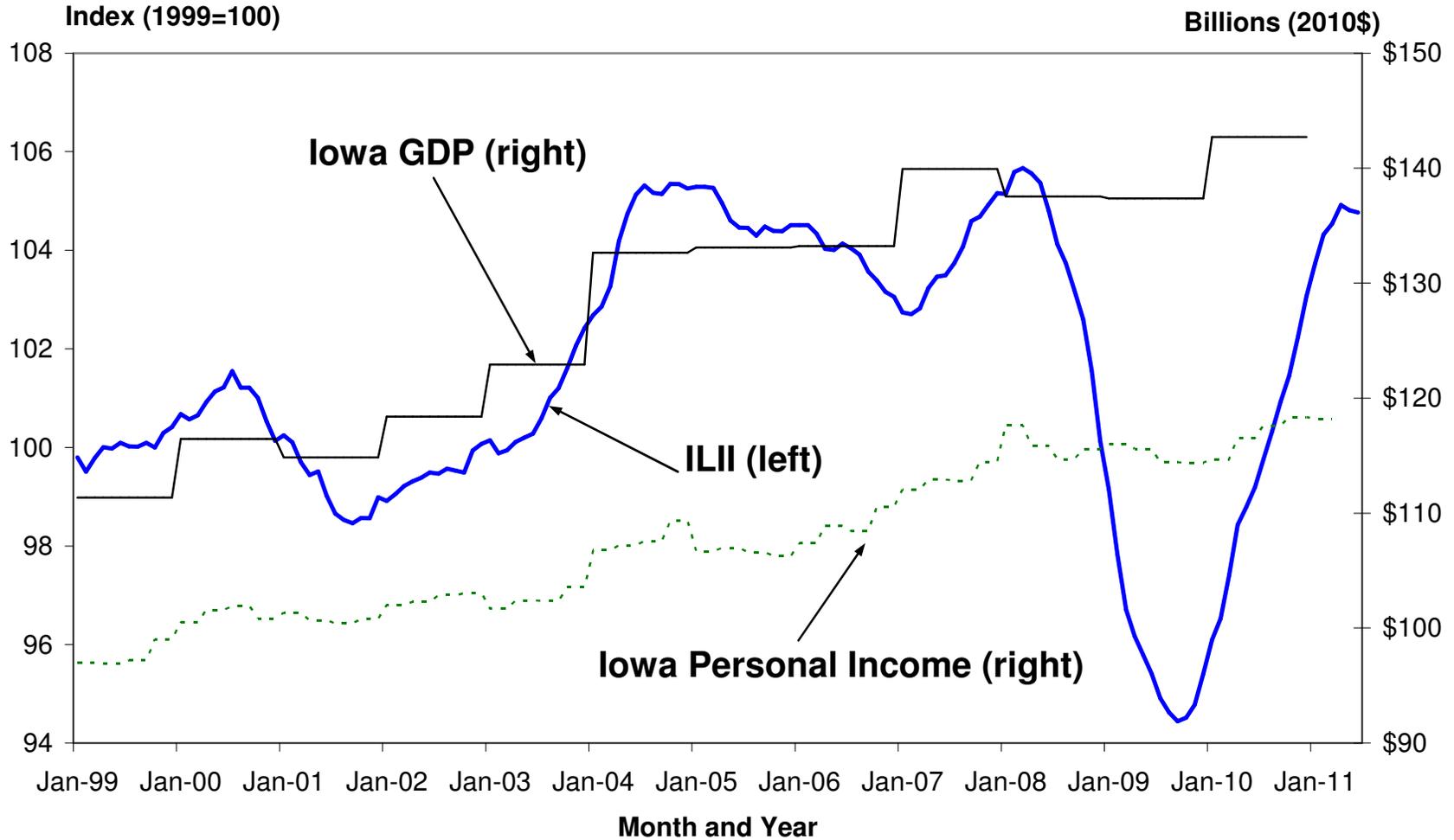
The Iowa Leading Indicators Index has established a good record during the recent recession and recovery. With the success of the ILII in providing leading signals, the Department will continue to

closely monitor the ILII with the hope that it will continue to inform policy makers about the direction of future economic activity in the State.

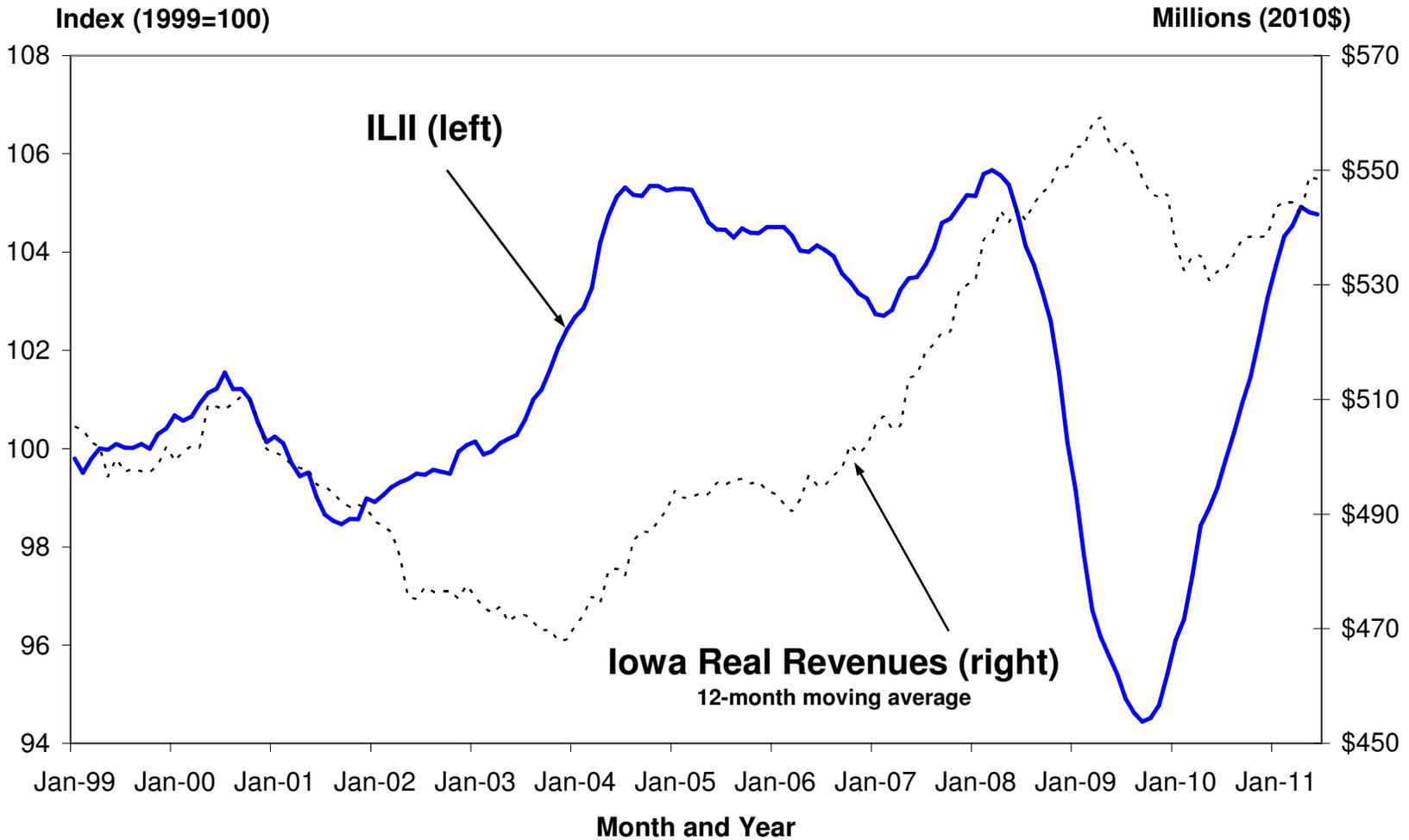
**Figure 1. Iowa Leading Indicators Index and Iowa Non-Farm Employment Coincident Index: January 1999-June 2011**



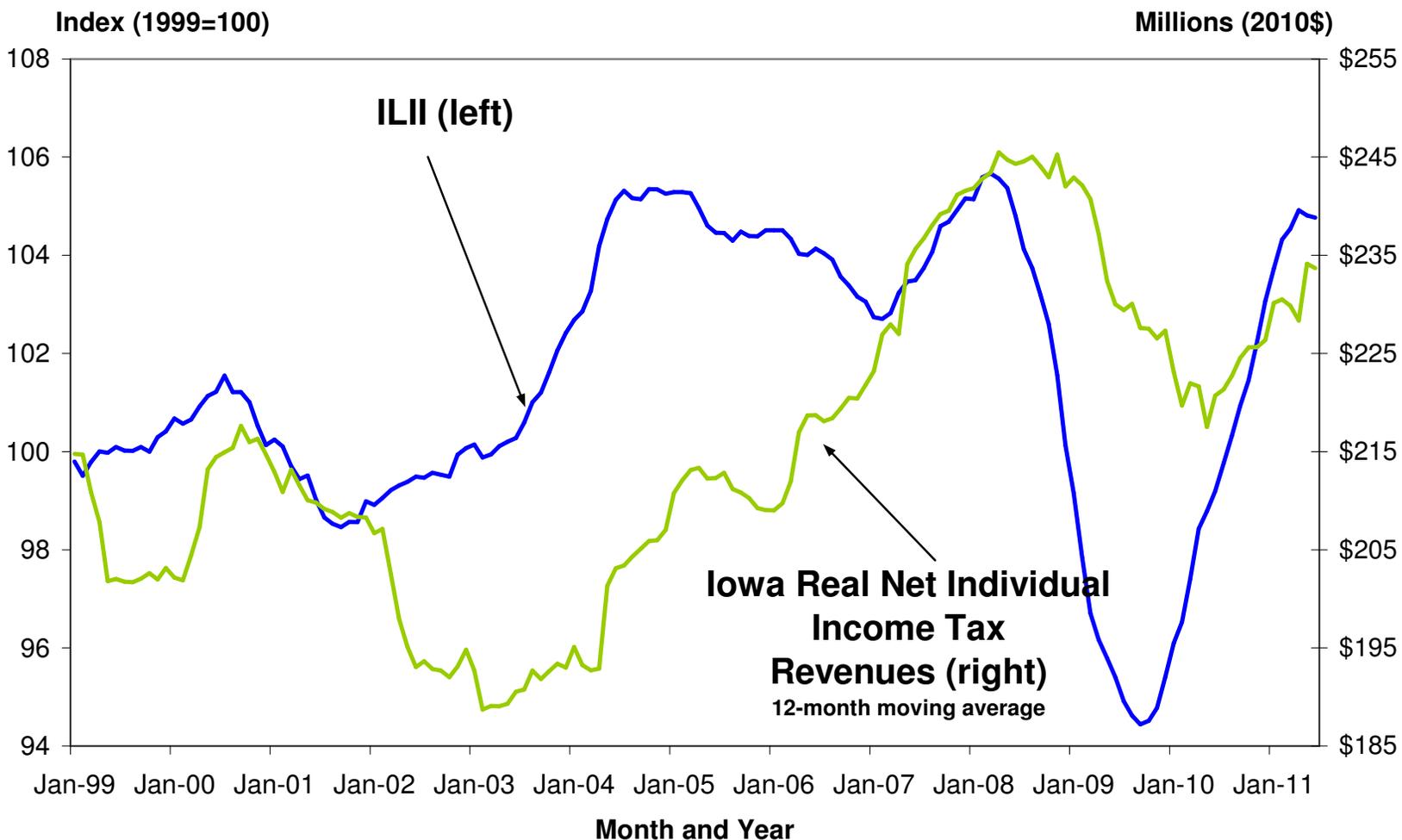
**Figure 2. Iowa Leading Indicators Index, Iowa GDP, and Iowa Personal Income: January 1999-June 2011**



**Figure 3. Iowa Leading Indicators Index and Iowa Real Tax Revenues:  
January 1999-June 2011**



**Figure 4. Iowa Leading Indicators Index and Iowa Real Net Individual Income Tax Revenues Index: January 1999-June 2011**



**Table 1. Iowa Leading Indicators Index Components: Annual Overview**

Component Series Monthly Values <sup>a</sup>	2010 June	2011 June	Contribution to ILII Change
AFPI <sup>b</sup> ↑ <sup>c</sup>			2.59
Corn Profits (cents per bushel)	11.9	275.4	
Soybean Profits (cents per bushel)	151.5	521.9	
Hog Profits (cents per pound)	15.2	22.1	
Cattle Profits (cents per pound)	0.8	4.2	
Iowa Stock Market Index (10=1984-86) ↑	62.00	71.43	0.24
Yield Spread (10-year less 3-month) ↓	3.08	2.96	-0.04
Building Permits ↓	672	622	-0.29
Average Weekly Unemployment Claims <sup>d</sup> ↑	6,124	4,080	1.39
Average Weekly Manufacturing Hours ↑	40.4	40.7	0.20
New Orders Index (percent) ↑	64.2	70.6	0.39
Diesel Fuel Consumption (mil gallons) ↑	52.18	54.94	0.96

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 17, 2011

a. For all component series except for the yield spread (the only national series) and the Iowa stock market index the values represent 12-month backward moving averages.

b. The agricultural futures profits index is computed as the sum of the standardized symmetric percent changes in the four series, each weighted by the commodity's annual share of Iowa cash farm income (updated August 31, 2010).

c. Arrows indicate the direction of the series' contribution to the ILII over the last 12 months

d. Changes in unemployment claims are inverted when added to the ILII, thus a negative change in the series contributes positively to the index.

**Table 2. Changes in ILII Standardization Factors Accounting for FY 2011 Data**

<b>Leading Indicator</b>	<b>Jul-2010 Standard Deviation</b>	<b>Jul-2011 Standard Deviation</b>	<b>Percent Change in Standard Deviation</b>	<b>Jul-2010 Standardization Factor</b>	<b>Rank</b>	<b>Jul-2011 Standardization Factor</b>	<b>Rank</b>	<b>Percent Change in Standardization Factor</b>
Agricultural Futures Profits Index	1.661	1.944	17.1%	0.054	5	0.046	5	-13.8%
Iowa Stock Market Index	5.292	5.181	-2.1%	0.017	8	0.017	8	3.1%
Yield Spread	0.275	0.272	-1.0%	0.326	1	0.332	1	2.0%
Building Permits	2.434	2.403	-1.3%	0.037	6	0.038	6	2.2%
Average Weekly Unemployment Claims	2.607	2.749	5.4%	0.034	7	0.033	7	-4.3%
Average Weekly Manufacturing Hours	0.314	0.317	0.7%	0.285	2	0.285	2	0.2%
New Orders Index	1.449	1.446	-0.1%	0.062	4	0.062	4	1.1%
Diesel Fuel Consumption	0.481	0.485	0.9%	0.186	3	0.186	3	0.0%

Each data series considers month-to-month changes over January 1999 to June 2010 for July 2010 values and January 1999 to June 2011 for July 2011 values. For all series except for the yield spread and the Iowa stock market index, the changes are based on 12-month backward moving averages. The yield spread and new orders index changes are simple arithmetic changes; changes for the other six components are computed as symmetric percentage changes.

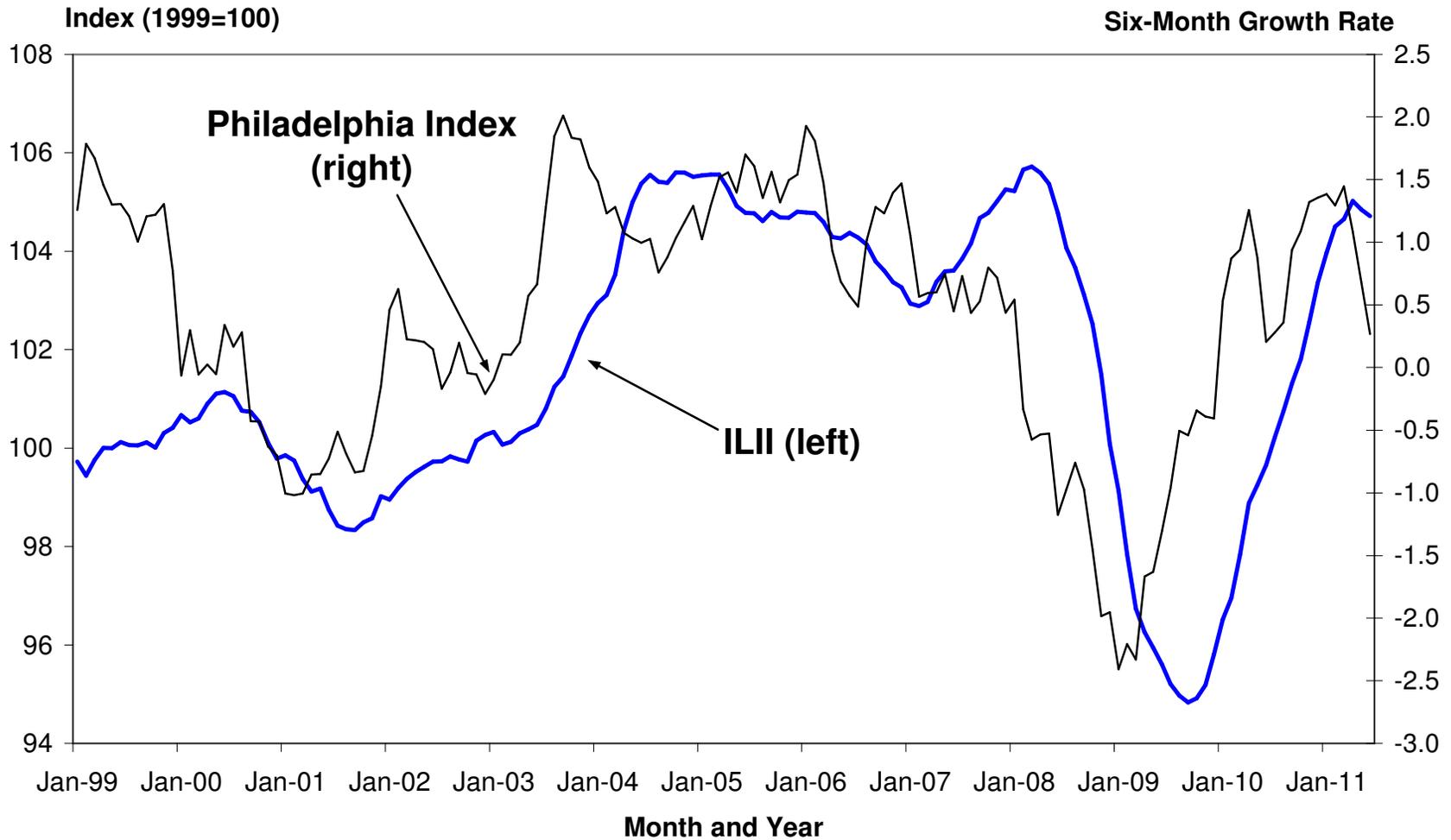
**Table 3. Iowa Leading Indicators Index Component Sensitivity**

<b>Six-Month Values</b>	Jan to July	Feb to August	Mar to September	Apr to October	May to November	June to December	July to January	Aug to February	Sept to March	Oct to April	Nov to May	Dec to June
<b>ILII</b>												
Percentage Change (Annualized)	7.5%	7.7%	7.0%	5.8%	6.6%	7.4%	7.5%	7.6%	6.7%	6.4%	4.6%	2.8%
Diffusion Index	75.0	87.5	75.0	62.5	75.0	87.5	87.5	87.5	87.5	87.5	87.5	50.0
<b>ILII without AFPI</b>												
Percentage Change (Annualized)	7.3%	7.2%	6.1%	4.5%	5.0%	5.7%	5.6%	5.5%	4.6%	4.1%	2.1%	0.3%
Diffusion Index	71.4	85.7	71.4	57.1	71.4	85.7	85.7	85.7	85.7	85.7	85.7	42.9
<b>ILII without Iowa Stock Market</b>												
Percentage Change (Annualized)	7.7%	7.8%	7.3%	6.2%	6.7%	6.9%	6.9%	6.8%	6.1%	5.9%	4.4%	3.0%
Diffusion Index	85.7	85.7	85.7	71.4	71.4	85.7	85.7	85.7	85.7	85.7	85.7	57.1
<b>ILII without Average Manufacturing Hours</b>												
Percentage Change (Annualized)	7.3%	8.0%	7.2%	6.1%	7.4%	8.6%	9.4%	9.7%	9.0%	9.1%	7.2%	5.2%
Diffusion Index	71.4	85.7	71.4	57.1	71.4	85.7	85.7	85.7	85.7	100.0	100.0	57.1
<b>ILII without Yield Spread</b>												
Percentage Change (Annualized)	12.2%	12.7%	11.7%	10.1%	10.6%	11.1%	11.0%	10.5%	9.3%	8.6%	6.4%	4.4%
Diffusion Index	85.7	100.0	85.7	71.4	85.7	85.7	85.7	85.7	85.7	85.7	85.7	57.1
<b>ILII without Diesel Fuel</b>												
Percentage Change (Annualized)	8.3%	8.1%	6.9%	5.3%	6.1%	7.1%	7.3%	7.3%	6.8%	6.8%	5.3%	3.0%
Diffusion Index	71.4	85.7	71.4	57.1	71.4	85.7	85.7	85.7	85.7	85.7	85.7	42.9
<b>ILII without New Orders Index</b>												
Percentage Change (Annualized)	5.9%	6.0%	5.5%	4.7%	6.0%	7.1%	7.2%	7.4%	6.6%	6.3%	4.4%	2.9%
Diffusion Index	71.4	85.7	71.4	57.1	71.4	85.7	85.7	85.7	85.7	85.7	85.7	42.9
<b>ILII without Unemployment Claims</b>												
Percentage Change (Annualized)	5.9%	6.0%	5.3%	4.0%	5.0%	5.9%	6.1%	6.3%	5.5%	5.5%	3.6%	1.9%
Diffusion Index	71.4	85.7	71.4	57.1	71.4	85.7	85.7	85.7	85.7	85.7	85.7	42.9
<b>ILII without Building Permits</b>												
Percentage Change (Annualized)	6.8%	7.3%	7.2%	6.8%	7.5%	8.3%	8.4%	8.5%	7.5%	6.5%	4.7%	3.0%
Diffusion Index	71.4	85.7	71.4	71.4	85.7	100.0	100.0	100.0	100.0	85.7	85.7	57.1

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 18, 2011 using updated standardization factors through June 2011.

A diffusion index measures the proportion of components that are rising based on the actual changes (not the standardized contributions to the ILII). Components experiencing increases greater than 0.05 percent are assigned a value of 1.0, components that experience changes less than an absolute value of 0.05 percent are assigned a value of 0.5, and components experiencing decreases greater than 0.05 percent are assigned a value of 0.0. The Conference Board considers a contraction signal reliable when the index declines by at least two percent over a six-month period (using an annualized rate) and a majority of the individual components also decline over those six months measured as a six-month diffusion index value below 50.

**Figure 5. Iowa Leading Indicators Index and Philadelphia Federal Reserve Iowa Leading Index: January 1999-June 2011**

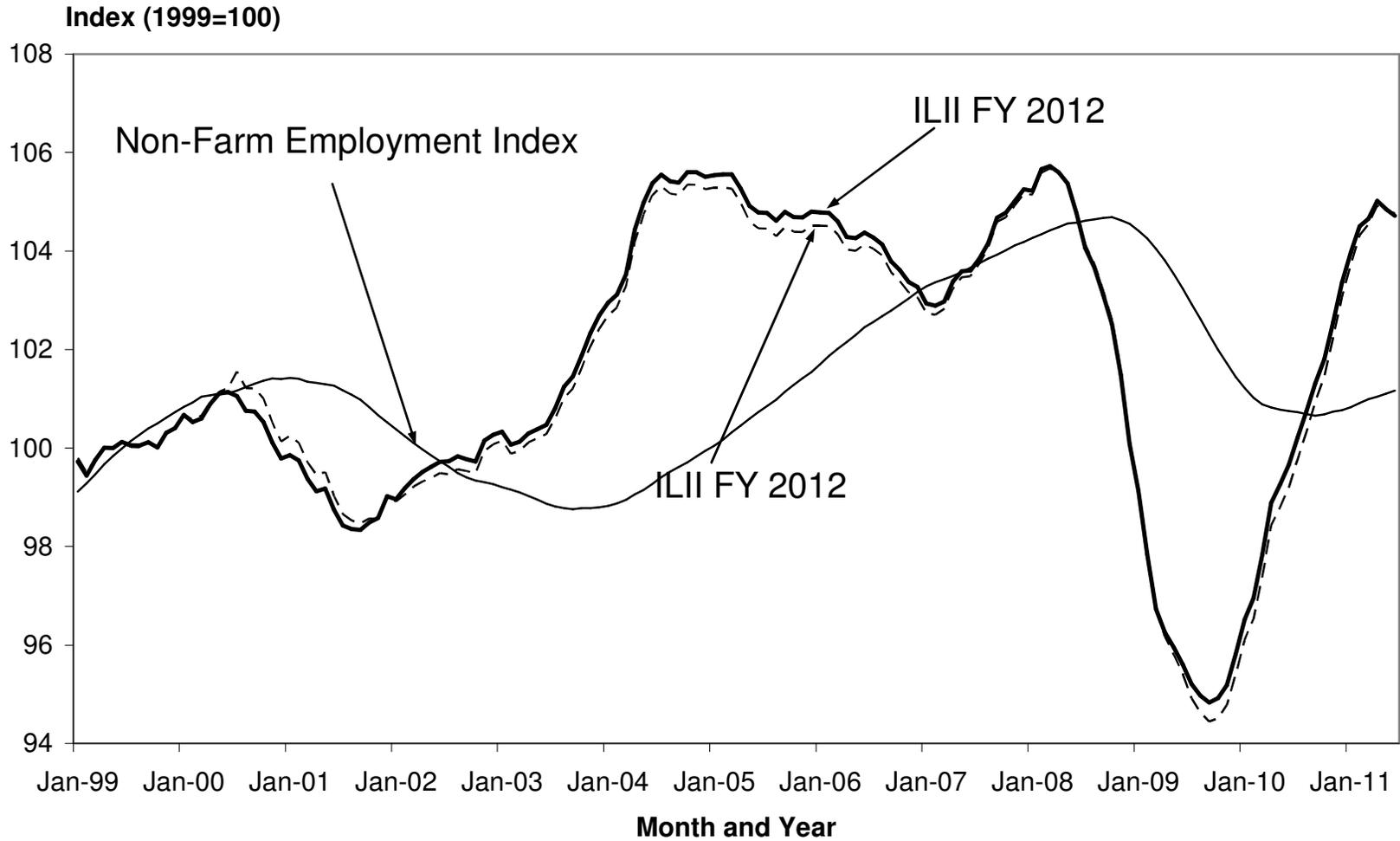


**Table 4. Changes in ILII Standardization Factors After Iowa Stock Market Index and AFPI Updates**

<b>Leading Indicator</b>	Jul-2010 Standard Deviation	Jul-2011 Standard Deviation	Percent Change in Standard Deviation	Jul-2010 Standardization Factor	Rank	Jul-2011 Standardization Factor	Rank	Percent Change in Standardization Factor
Agricultural Futures Profits Index	1.661	1.817	9.4%	0.054	5	0.050	5	-8.1%
Iowa Stock Market Index	5.292	4.994	-5.6%	0.017	8	0.018	8	6.6%
Yield Spread	0.275	0.272	-1.0%	0.326	1	0.331	1	1.6%
Building Permits	2.434	2.403	-1.3%	0.037	6	0.037	6	1.8%
Average Weekly Unemployment Claims	2.607	2.749	5.4%	0.034	7	0.033	7	-4.6%
Average Weekly Manufacturing Hours	0.314	0.317	0.9%	0.285	2	0.284	2	-0.3%
New Orders Index	1.449	1.446	-0.1%	0.062	4	0.062	4	0.7%
Diesel Fuel Consumption	0.481	0.485	0.9%	0.186	3	0.185	3	-0.3%

Each data series considers month-to-month changes over January 1999 to June 2010 for July 2010 values and January 1999 to June 2011 for July 2011 values. For all series except for the yield spread and the Iowa stock market index, the changes are based on 12-month backward moving averages. The yield spread and new orders index changes are simple arithmetic changes; changes for the other six components are computed as symmetric percentage changes.

**Figure 6. Comparison of Iowa Leading Indicators Index in FY 2011 and Update for FY 2012: January 1999-June 2011**



**Table 5. Iowa Leading Indicators Index: Six Month Overview for June 2011  
Prior to the FY 2012 Update**

Monthly Values	2011					
	January	February	March	April	May	June
ILII	103.7	104.3	104.5	104.9	104.8	104.8
Percentage Change <sup>a</sup>	0.6%	0.6%	0.2%	0.4%	-0.1%	-0.1%
Diffusion Index <sup>b</sup>	75.0	75.0	50.0	62.5	37.5	37.5
<hr/>						
Six-Month Values	Jul to January	Aug to February	Sep to March	Oct to April	Nov to May	Dec to June
ILII						
Percentage Change	4.0%	4.0%	3.6%	3.4%	2.5%	1.6%
Annualized Percentage Change	7.9%	8.0%	7.2%	6.8%	5.0%	3.3%
Diffusion Index	87.5	87.5	87.5	87.5	87.5	50.0

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced July 28, 2011.

a. Percentage changes in the ILII do not always equal changes in the level of the ILII due to rounding.

b. A diffusion index measures the proportion of components that are rising based on the actual changes (not the standardized contributions to the ILII). Components experiencing increases greater than 0.05 percent are assigned a value of 1.0, components that experience changes less than an absolute value of 0.05 percent are assigned a value of 0.5, and components experiencing decreases greater than 0.05 percent are assigned a value of 0.0.

**Table 6. Iowa Leading Indicators Index: Six Month Overview for June 2011  
After the FY 2012 Update**

Monthly Values	2011					
	January	February	March	April	May	June
ILII	104.0	104.5	104.7	105.0	104.8	104.7
Percentage Change <sup>a</sup>	0.6%	0.5%	0.1%	0.3%	-0.2%	-0.1%
Diffusion Index <sup>b</sup>	75.0	75.0	50.0	75.0	37.5	37.5
<hr/>						
Six-Month Values	Jul to January	Aug to February	Sep to March	Oct to April	Nov to May	Dec to June
ILII						
Percentage Change	3.8%	3.7%	3.3%	3.2%	2.2%	1.3%
Annualized Percentage Change	7.5%	7.5%	6.6%	6.3%	4.5%	2.6%
Diffusion Index	87.5	87.5	87.5	87.5	87.5	62.5

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 30, 2011.

a. Percentage changes in the ILII do not always equal changes in the level of the ILII due to rounding.

b. A diffusion index measures the proportion of components that are rising based on the actual changes (not the standardized contributions to the ILII). Components experiencing increases greater than 0.05 percent are assigned a value of 1.0, components that experience changes less than an absolute value of 0.05 percent are assigned a value of 0.5, and components experiencing decreases greater than 0.05 percent are assigned a value of 0.0.

**Table 7. Iowa Leading Indicators Index Components: Six Month Overview for June 2011 Prior to the FY 2012 Update**

Component Series Monthly Values <sup>a</sup>		2011					
		January	February	March	April	May	June
AFPI <sup>b</sup>	↑ <sup>c</sup>	4.4	5.0	4.8	5.4	4.3	3.1
Corn Profits (cents per bushel)		123.8	153.8	183.2	219.6	252.5	275.4
Soybean Profits (cents per bushel)		322.6	364.4	407.4	449.0	491.7	521.9
Hog Profits (cents per pound)		23.1	23.4	23.3	23.2	22.4	22.1
Cattle Profits (cents per pound)		5.7	5.9	6.1	5.9	5.0	4.2
Iowa Stock Market Index (10=1984-86)	↓	77.92	80.54	78.47	77.75	74.40	71.43
Yield Spread (10-year less 3-month)	↓	3.24	3.45	3.31	3.40	3.13	2.96
Building Permits	↓	624	613	605	624	624	622
Average Weekly Unemployment Claims <sup>d</sup>	↑	4,567	4,453	4,328	4,254	4,170	4,080
Average Weekly Manufacturing Hours	↓	41.3	41.2	41.1	40.9	40.8	40.7
New Orders Index (percent)	↓	72.2	73.6	74.1	74.0	72.9	70.6
Diesel Fuel Consumption (mil gallons)	↑	54.57	54.87	54.92	54.99	54.74	54.94

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced July 28, 2011.

a. For all component series except for the yield spread and the Iowa stock market index, the values represent 12-month backward moving averages.

b. The agricultural futures profits index is computed as the sum of the standardized symmetric percent changes in the four series, each weighted by the commodity's annual share of Iowa cash farm income (updated August 31, 2010).

c. Arrows indicate the direction of the series' contribution to the ILII for the latest month.

d. Changes in unemployment claims are inverted when added to the ILII, thus a negative change in the series contributes positively to the index.

**Table 8. Iowa Leading Indicators Index Components: Six Month Overview for June 2011 After the FY 2012 Update**

Component Series Monthly Values <sup>a</sup>		2011					
		January	February	March	April	May	June
AFPI <sup>b</sup>	↑ <sup>c</sup>	3.8	4.4	4.1	4.5	3.4	2.5
Corn Profits (cents per bushel)		124.3	154.2	183.5	219.7	252.5	275.4
Soybean Profits (cents per bushel)		324.1	365.5	408.2	449.4	491.7	521.9
Hog Profits (cents per pound)		23.1	23.4	23.3	23.2	22.4	22.1
Cattle Profits (cents per pound)		5.7	5.9	6.1	5.9	5.0	4.2
Iowa Stock Market Index (10=1984-86)	↓	70.55	72.91	71.01	72.60	69.68	66.89
Yield Spread (10-year less 3-month)	↓	3.24	3.45	3.31	3.40	3.13	2.96
Building Permits	↓	624	613	605	624	624	622
Average Weekly Unemployment Claims <sup>d</sup>	↑	4,567	4,453	4,328	4,254	4,170	4,080
Average Weekly Manufacturing Hours	↓	41.3	41.2	41.1	40.9	40.8	40.7
New Orders Index (percent)	↓	72.2	73.6	74.1	74.0	72.9	70.6
Diesel Fuel Consumption (mil gallons)	↑	54.57	54.87	54.92	54.99	54.74	54.94

Source: Tax Research and Program Analysis Section, Iowa Department of Revenue, produced August 30, 2011.

a. For all component series except for the yield spread and the Iowa stock market index, the values represent 12-month backward moving averages.

b. The agricultural futures profits index is computed as the sum of the standardized symmetric percent changes in the four series, each weighted by the commodity's annual share of Iowa cash farm income (updated August 30, 2011).

c. Arrows indicate the direction of the series' contribution to the ILII for the latest month.

d. Changes in unemployment claims are inverted when added to the ILII, thus a negative change in the series contributes positively to the index.

## Appendix A: Computation of the Iowa Leading Indicators Index

The ILII was computed following the five step process presented in the *Business Cycle Indicators Handbook* by The Conference Board.

1. Calculate month-to-month changes for each component. For the components already in percent form (including the yield spread and the new orders index) simple arithmetic differences are calculated. For the other components, a symmetric percent change formula is used because this formula will return the original value if equal positive and negative changes occur in consecutive months.

$$= 200 * (\text{current month value} - \text{last month value}) / (\text{current month value} + \text{last month value})$$

2. Multiply each component's month-to-month changes by the standardization factor. Standardization factors, the inverse of the standard deviation of the changes in the series normalized across all series to sum to one, equalize the volatility of each component in the index (see Table 4 for the standardization factors currently being used).
3. Add the standardized month-to-month changes across all eight indicators to compute each monthly ILII change.
4. Compute preliminary values of the index using a cumulative symmetric percent change formula. The initial month's value is set to 100, then to compute the cumulative change of the index, each of the index's value is multiplied by the following monthly change:

$$ILII_0 = 100$$

$$ILII_1 = ILII_0 * (200 + \text{month one ILII change}) / (200 - \text{month one ILII change})$$

5. Rebase the index to average 100 in the base year (1999). The preliminary levels are multiplied by 100 and divided by the average preliminary value over the 12 months in 1999.

Because many of the series are subject to a lot of seasonal variation, before calculating month-to-month changes all series except the yield spread and the Iowa stock market index are smoothed by taking 12-month backward moving averages.

The standardization factors are recalculated and any revisions to historical data (beyond the previous two months) are incorporated annually during the summer.

The Non-Farm Employment Coincident Index is computed following this same method; however, with only one component, steps 2 and 3 are unnecessary.

## **Appendix B: Computation of the Diffusion Index**

A diffusion index measures the proportion of components rising in a given time period. Components experiencing an increase of more than 0.05 percent are assigned a value of 1.0; components experiencing a change in absolute value of 0.05 percent or less are assigned a value of 0.5; components experiencing a decrease of more than 0.05 percent are assigned a value of 0.0. These assigned values are then summed over all of the components. The sum is multiplied by 100 and divided by the number of components. Thus a value below 50 indicates more than half of the components declined in value during the period of interest.

The diffusion index is based on the actual changes in the components, not the standardized contributions used to compute the ILII. A diffusion index is computed for one-month and six-month symmetric percent changes in the components (see Figure B1).

**Figure B1. Iowa Leading Indicators Index One-Month and Six-Month Diffusion Indexes: Jan. 1999-June 2011**

